Preventative Screening Use among Medically Underserved Patients from Central Appalachia

Undergraduate Honors Thesis
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I. Acknowledgements

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II. Abstract

Purpose: Previous research has demonstrated the potential for preventative health services to help address the existing health disparities in Central Appalachia. The Remote Area Medical Corps (RAM) Clinic in Wise County, Virginia provides a critical opportunity to understand preventative screening rates and factors affecting use for medically underserved patients in the region. This thesis contributes to existing regional research by being the first to survey a large, regional sample of underserved patients.

Methods: Over the course of three days, 205 patients were surveyed using questions primarily taken from two national health surveys. Patient characteristics and screening rates were compared to national data from the US Census and previous analysis of national health surveys. In addition, multi-variable model selection was used to identify the best predictors of screening use for RAM patients.

Results: RAM patients overwhelmingly have low rates of preventative screening use according to the United States Preventative Screening Task Force Guidelines. On average, patients were missing at least a third of the recommended screenings. Colon, breast and cervical cancer screening rates fall well below the national averages. Blood pressure, blood cholesterol and lung cancer screening use is low. Model selection results show the importance of a healthcare visit within the past year, access to a personal provider and a routine checkup.

Conclusions: Low screening rates combined with the existing mortality disparities and established benefits of early screening demonstrate the need and potential of health care reform to improve regional preventative services use.

III. Introduction

During a three day period in July, over two thousand patients received care at the Remote Area Medical Volunteer Corps (RAM) Clinic in Wise County, Virginia (1). The RAM Clinic in Wise is currently considered the largest medical outreach clinic in the US given the high patient volume and short time frame (2).The clinic provides care to medically underserved patients from the surrounding counties of Northeast Tennessee, Southwest Virginia and Eastern Kentucky. For many of these underserved patients who are uninsured or underinsured, RAM provides a critical source of health care. These patients spend hours sleeping in their cars and waiting in lines to receive care in tents, converted livestock stalls and mobile van units at the county fairgrounds. To date, no prior research has been undertaken to learn from these patients. The clinic's regional scope and high patient volume provide an opportunity to understand the health care needs and behavior of underserved patients in the Central Appalachian region.

The Appalachian region as a whole suffers significant health disparities in morbidity and mortality when compared to the rest of the US and these disparities are highly concentrated in Central Appalachia (3-5). Inequalities in cancer, heart disease and stroke mortality are particularly evident. Previous research within Appalachia has demonstrated the role of the socioeconomic environment, available healthcare system, physical environment and health behavior in contributing to the existing disparities (4-18). While health disparities are complex and multidimensional (19), I focus on the use of preventative screenings directly connected to regional morality disparities: blood pressure, blood cholesterol, colorectal cancer, prostate cancer, breast cancer, cervical cancer and lung cancer screenings. In general, preventative screenings can detect diseases early when they are easier to treat and can improve health outcomes in the long run. Previous research at the national level suggests that the selected

preventative screenings could decrease the regional mortality disparities (20-23). As a result, I concentrate on understanding preventative screening use for medically underserved patients in the region attending the RAM clinic in Wise County.

Awareness of preventing screening rates and contributing factors holds important implications for future RAM clinics and policy efforts to improve health outcomes in the surrounding region. I aim to answer three fundamental questions: 1) Who are the RAM patients and how do they compare to the national population in terms of socioeconomic status, healthcare access and health needs? 2) What are the preventative screening use rates for RAM patients? 3) What barriers are limiting patient's use of preventative screenings? To do so, I rely on 205 patient surveys conducted during the Wise Clinic in 2014.

IV. Background

A. Appalachia

Appalachia is a region consisting of 420 counties in 13 states. The region itself is divided into subregions composed of contiguous areas with similar characteristics in terms of topography, demographics, and economics. Figure 1 displays the region with subregional divisions visible.

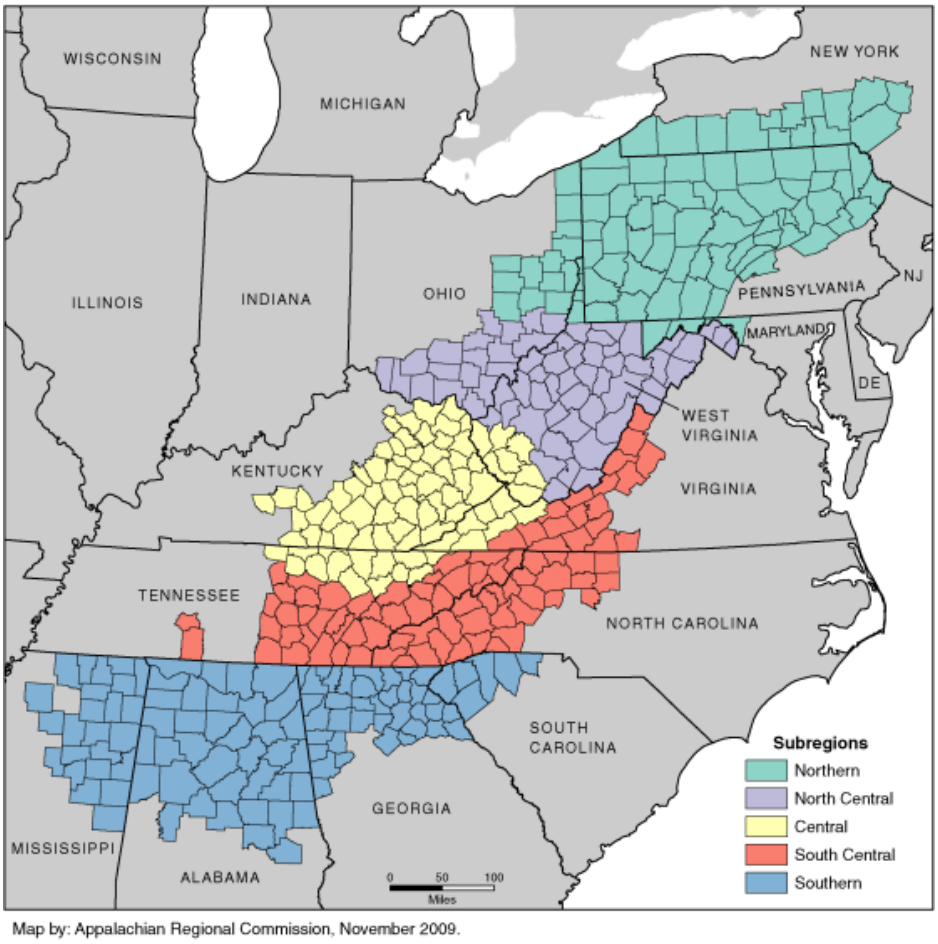


Figure 1. Subregions in Appalachia. Source: Appalachian Regional Commission, 2009.

Despite the characterization of a singular Appalachia identity, a wide distribution of socioeconomic status exists as measured by poverty, education, and employment (24). Figure 2

shows the distribution of countywide economic status, and demonstrates that this distribution reflects the subregion divisions. Counties at distressed and at-risk economic levels, cluster in the region of Eastern Kentucky, Northeast Tennessee and Southwest Virginia.

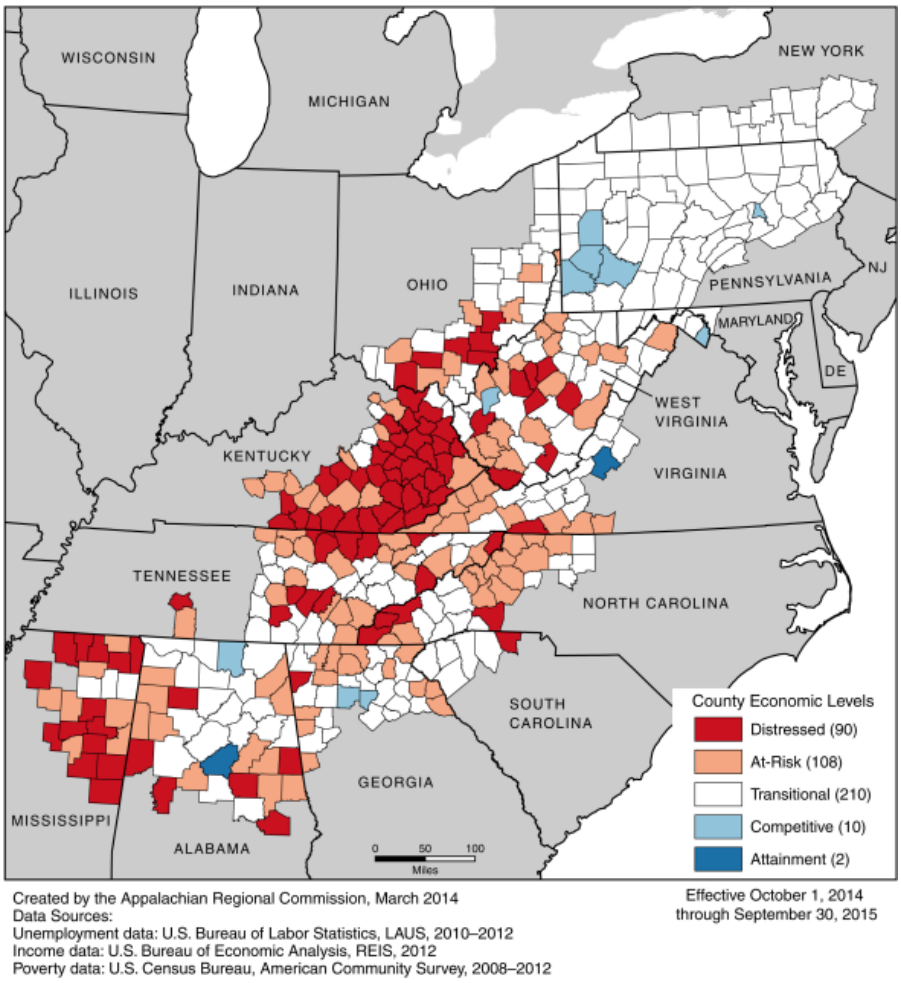


Figure 2: County economic status. Source: Appalachian Regional Commission, 2009

Due to this regionalization, I present data, when available, on a subregional level. Because the Wise County RAM Clinic is located there, special attention will be given to highlight the relevant regional data for Central Appalachia.

B. Appalachian Health Disparities

The Appalachian region, as a whole, suffers significant health disparities[i] when compared to the rest of the US (3-5). The region has excess mortality in premature deaths (deaths of persons ages 35-64) for heart disease, all cancers combined, lung cancer, colorectal cancer, chronic obstructive pulmonary disease and diabetes (3). Similar morbidity disparities exist for heart disease, cancer, chronic pulmonary disease, stroke and diabetes (3).

While these health disparities affect the region as a whole, they are concentrated in select regions, notably Central Appalachia and areas in the immediate vicinity (3). Premature mortality and excess morbidity for heart disease, all cancers combined, lung cancer, diabetes and Chronic Obstructive Pulmonary Disease (COPD) all cluster in the Central Appalachian (3). Figure 3 displays this geographic clustering for all cancers and heart disease.

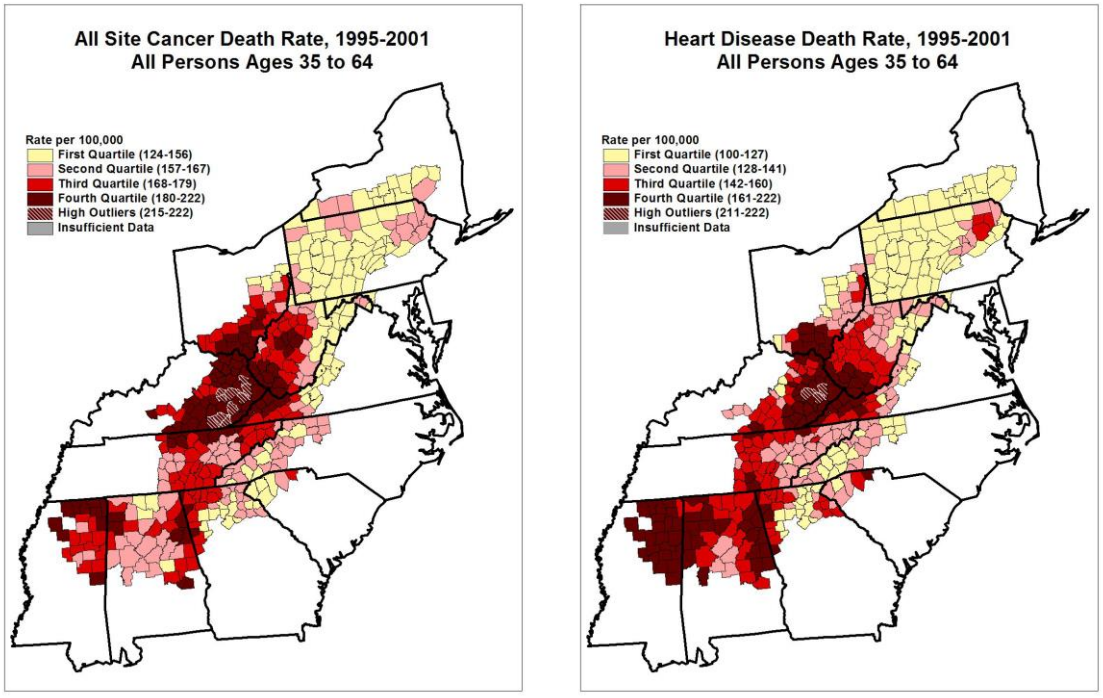


Figure 3. Premature Cancer and Heart Disease Death Rates, Source: Halverson et al., 2004

[i] The National Institute of Health defines a health disparity as "a significant disparity in the overall rate of disease incidence, prevalence, morbidity, mortality, or survival rates in the population as compared to the health status of the general population"

The striking geographic pattern of premature mortality and morbidity warrants attention to identify the potential determinants of these poor health outcomes.

C. Factors Underlying Health Outcomes

Health disparities are complex, dynamic and multidimensional (19). Previous research in Appalachia has identified four contributing factors that affect health outcomes: 1) socioeconomic environment 2) available healthcare system 3) physical environment and 4) health behavior.

Indicators of socioeconomic distress, constructed from socioeconomic variables,[ii] correlate significantly to poor health outcomes across Appalachian counties (5). Within Central Appalachia, poor socioeconomic conditions correlate to all-cause mortality, heart disease mortality and cancer mortality (4). Though low socioeconomic status is one of the most critical predictors of poor health outcomes (25-27), socioeconomic variables do not explain the full picture. Regions in Appalachia with similar socioeconomic conditions do not necessarily experience similar health outcomes (4).

The available health care system also affects health outcomes in the region. In 2004, 318 of 420 Appalachian counties were classified as health professional shortage areas by the Federal Health Resources and Services Administration (6, 28). In addition to a lack of available healthcare system resources, social distance[iii] between health care providers and Appalachian populations affect accessibility of the health care system (6). This social distance results largely from education and income differences between the two groups, but is also due to the fact that many health professionals come from outside the area.

[ii] Poverty, income levels, employment status, and education level were all used, individually or combined, to measure socioeconomic status (1) (Halverson, 2004).
[iii] Social distance refers to differences in socioeconomic backgrounds that create barriers in communication between individuals.

The physical environment also correlates to health outcomes, most importantly with regards to coal mining. Environmental "riskscape" models that incorporate socioeconomic and environmental stressors such as education outcomes and carcinogens from coal production demonstrate a relationship between the physical environment and health outcomes (7, 8).

Health behavior, a behavior or life choice that impacts an individual's health status, also shapes regional health outcomes (9). Smoking and cancer screening rates have previously received the most attention in Appalachia (9). Both behaviors pose challenges to improving health outcomes in Central Appalachia. Smoking prevalence is higher in Central Appalachia compared to the rest of the country(3, 10). Similarly, researchers have concluded that the cancer screening use within recommended guidelines is significantly lower within Appalachia (11-18).

D. A Focus on Preventative Screening Use

This thesis focuses on a specific health behavior, preventative screening use for the following: blood pressure, blood cholesterol, colorectal cancer, prostate cancer, breast cancer and lung cancer screenings. These screenings were examined due to their direct connection to existing mortality disparities in the region. Preventative health screenings do not necessarily impact disease prevalence, but can lower disease mortality through early detection and more effective treatment (29). In the case of cancer mortality, low screening use contributes to late-stage diagnoses which can in turn lead to poorer treatment outcomes. While there is a general perception of low cancer screening use, the lack of research regarding late-stage diagnosis rates helps to highlight the need for further research in the area (9). Cancer screening use deserves special attention in Central Appalachia given the mortality disparities for all cancers combined, lung and colorectal cancer. Similarly, blood pressure and blood cholesterol screenings are directly associated with the existing mortality disparity for heart disease. Patients with high

cholesterol levels are at a higher risk of developing heart disease, and the prevalence of high cholesterol in the region is higher than the national average (30). Hypertension or high blood pressure is a major risk for heart disease and stroke as well as other serious medical conditions(31). Prior research not only indicates high prevalence of hypertension in the region, but also reveals high hospitalization rates for hypertension(29). Increased screening for hypertension could improve the mortality disparities for heart disease and stroke by getting at risk patients identified and treated. Given the significance for existing health disparities, I examine preventative screening use for an underserved patient population in the region.

To help contextualize the factors affecting preventative screening use, I utilize Andersen's Behavioral Model of Health Services Use, which has guided research on health behaviors and outcomes within the US for the last half-century. In Andersen's model, predisposing, enabling and need factors at environmental and individual levels influence health behaviors and health outcomes (32, 33). Figure 4 displays Andersen's model(33).

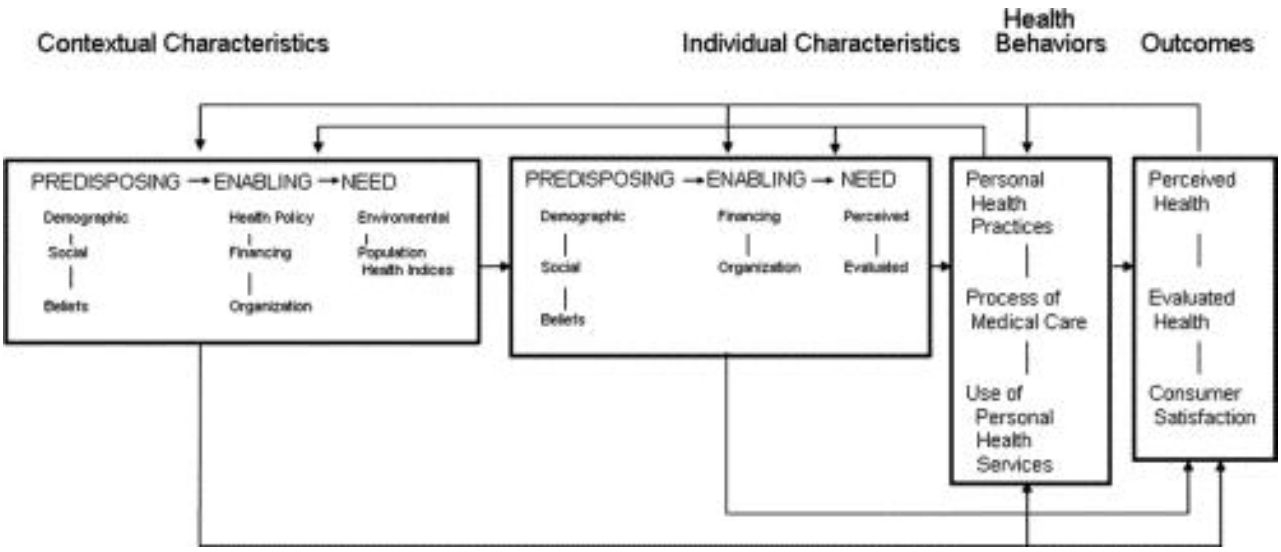


Figure 4. Andersen's Behavioral Model of Health Services Use, Source: Andersen, 2008

Predisposing characteristics such as age, gender and education affect both the likelihood a patient will need health care and their ability to access health care when needed. Enabling characteristics

such as income and health insurance coverage influence a patient's ability to receive health care. Likewise, a patient's self-assessed and clinically assessed health needs impact health behaviors and outcomes.

At the national level, previous research fits within this application of Andersen's model. Healthcare access, an enabling characteristic measured in part by having a routine or regular physician, has correlated in multiple separate studies to rates of breast, cervical, colorectal, prostate, and general preventative screenings (34-38). Additionally, predisposing individual characteristics of education and recognizing the need for screenings have both correlated to use of prostate and colorectal screenings respectively (37, 38). Similar research has occurred at the regional level.

Within Appalachia, previous research on preventative health can be understood through Andersen's model. The importance of cost, an enabling factor, has been linked to lower use of cancer screenings and other preventative screenings (39, 40). Predisposing characteristics including gender, cultural beliefs, awareness of need for screening have all been connected to generalized low use of cancer, cholesterol and preventative screenings (41-43). Other individual characteristics include living in remote locations, lack of transportation and low access to medical care (14, 17, 40, 44). For example, both a woman's physical distance from a health care provider and lack of insurance can impede her access to cancer screenings (3). Researchers have found that late stage diagnosis of breast cancer is more prevalent for patients who live more than 15 miles away from a health center or lack health insurance (45).

I contribute to existing research by being the first to study the unique clinical setting of the Remote Area Medical Clinic in Wise County, Virginia. Doing so allows for an

unprecedented focus on preventative screening use for critically underserved patients in the region.

F. Remote Area Medical Volunteer Corps

The Remote Area Medical Volunteer Corps (RAM) was founded in 1985 to bring medical care to remote regions around the world. RAM operates multiday clinics to provide medical, dental and vision care for the uninsured and underinsured. Though RAM's work originated in South America, they have more recently shifted to delivering care to underserved communities in the US. RAM has provided an estimated 90 million dollars in free health care treatment to over 180,000 patients across 180 clinics nationwide (2). The majority of RAM's current efforts are directed towards rural America, including Appalachia. Within Appalachia alone, RAM is scheduled to operate 12 clinics in the 2015 calendar year.

RAM began hosting clinics in Wise County, Virginia in 2000 at the Wise County Fairgrounds. This event is the largest medical outreach clinic in the US (2). In 2014, 2,244 patients received free care during the three-day clinic from July 18-20. There were a total of 5,227 medical (59.4%), dental (24.7%) and vision care (15.9%) encounters during this period (1). The total estimated value of these encounters was $1,930,572 (1). RAM serves as a critical source of care for the underserved patient population in the region. Before coming to the RAM clinic, patients were asked the years since they had last been to the doctor or seen another health care provider. Table 1Table 1summarizes patient's self-reported years since previous encounter with a health care professional.

Table 1. Years since contact with health care provider

Years	Medical Care (% of patients)	Dental Care (% of patients)	Vision Care (% of patients)
0 to 1	72.8	34.0	31.2
1 to 2	6.6	14.0	16.3
2 to 3	3.4	9.5	8.8
3 to 4	1.3	4.8	5.0
4 to 5	2.5	6.3	5.3
5 to 10	2.8	11.1	9.6
More than 10	2.9	12.5	12.6
Don't remember or no answer	7.9	7.8	11.2

Source: RAM Clinic in Wise, Clinic Report for 2014

Over 1 in 4 patients at the RAM's Wise Clinic had not seen a health care professional within the past year for medical care (1). Access to dental and vision care was considerably lower, with around two-thirds of patients reporting no encounters with a dental or vision provider in the past year (1). Due to the widespread need in the surrounding area, the RAM clinic in Wise has a regional scope.

Patients at the Wise clinic arrive and wait outside the fairgrounds to receive numbers. Traveling largely from the surrounding counties of Tennessee, Virginia, West Virginia and Kentucky, these patients camp out at the fairgrounds until they receive the needed care. Figure 5 visualizes the regional scope of the Wise County RAM Clinic by shading surrounding zip codes according to patient count data.

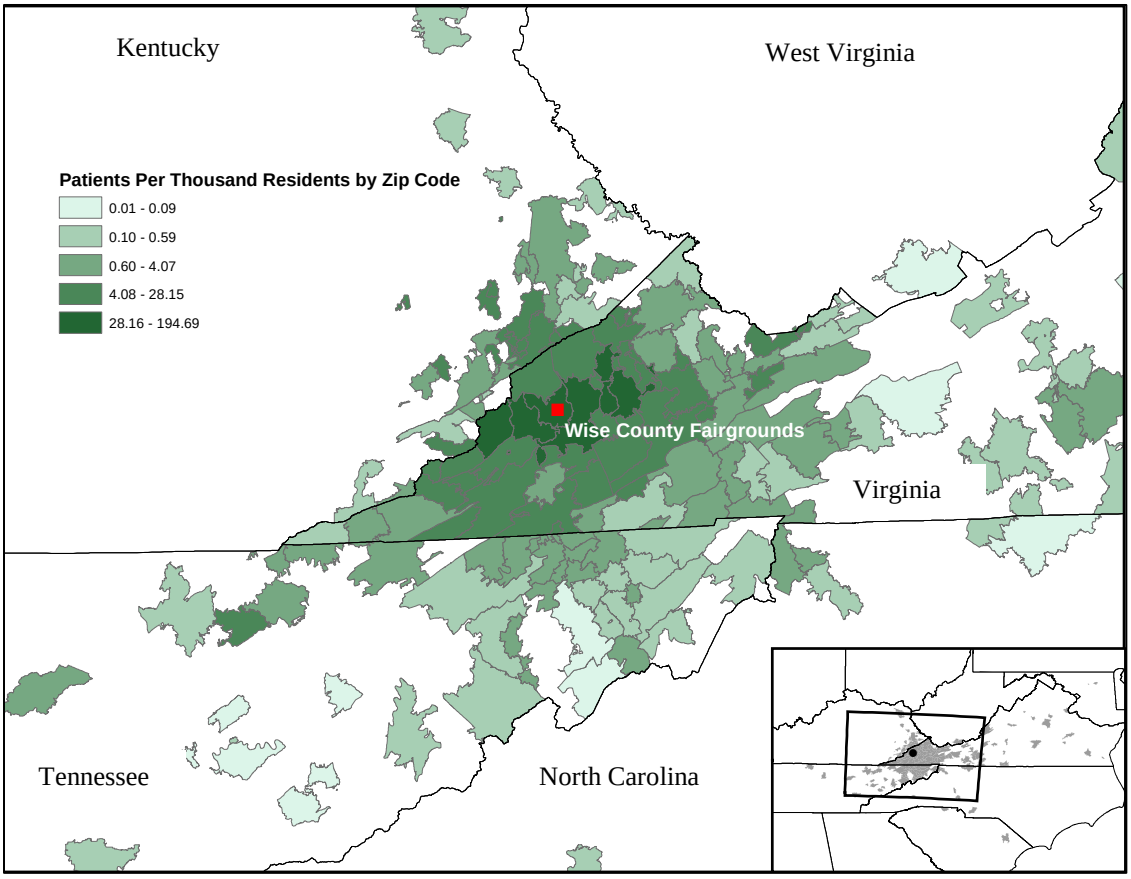


Figure 5. RAM Patients by Zip Code

The sheer number of RAM clinics within Appalachia, as well as the high number of patients attending these clinics, indicates the high number of underserved patients in the region, and demonstrates the need to improve health care policy for the region. RAM not only helps improve access to health care for patients in the regions, but also provides a critical research opportunity. The size of the RAM clinic in Wise provides an opportunity to reach a large sample of underserved patients within the region. In turn, this sample provides an understanding of health behavior for not only RAM patients, but also for the surrounding region (9).

V. Methodology

Over the course of three days, 205 patients at the RAM Clinic in Wise County, VA were surveyed in order to understand preventative screening use and patient characteristics affecting screening use. Survey questions were taken from two national health surveys: the Behavioral Risk Factor Surveillance System (BRFSS) and the National Health interview Survey (NHIS). Patient characteristics and screening rates were compared to US Census data and previous analysis of the two national health surveys. In addition, multi-variable regression models were selected according to Akaike Information Criterion (AIC) in order to identify the best predictors of screening use.

A. Participants and Sampling

Patients attending the RAM clinic in Wise, Virginia were surveyed July 17-19 2014. Male and female patients age 18 and older were eligible to participate in the survey. Non-random sampling was conducted. All patients meeting age requirements were asked to participate while waiting to receive care. Patients were approached as groups and individuals. In total, 205 surveys were completed; fewer than 20 patients approached refused to participate.

B. Measures

Questions for the survey were primarily taken from the Behavioral Risk Factor Surveillance System (BRFSS) and the National Health interview Survey (NHIS). These surveys situate RAM patients within a national context because prior research has established summary health statistics on individual characteristics and preventative screening use (46). Appendix 3 documents the source of each question. Of the 29 survey questions, only six questions were written for the purpose of this project and previously un-validated. The previously un-validated

questions were for the following variables: reason for health care visits in past year, number of health care visits at a free health clinic in the past year, whether preventative screenings had ever been received at a RAM clinic and self-described barriers to preventative screening use. Patient responses were limited to preselected options for all questions except for age and the number of health care visits in the past year. National measures were taken from previous analysis of these national surveys and US Census data.

C. Key Variables

Dependent Variables

Use of the following preventative screenings was assessed: blood pressure, blood cholesterol, colorectal cancer, prostate cancer, breast cancer and lung cancer screenings. For blood pressure and blood cholesterol screenings, patients were asked whether or not they had received the screening in the past year. For all others, patients were asked if they had ever received the screening and the time since their last screening. Binary indicators were created for each screening according to United States Preventative Screening Task Force (USPTF) guidelines (47). Though the prostate cancer screening, prostate-specific antigen test, is no longer recommended by USPTF, an indicator was created from previous guidelines in order to compare rates to previous national studies. Table 2 summarizes the classification for each missed screening indicator.

Table 2. Current USPTF Guidelines for Preventative Screenings

	Blood Pressure	Blood Cholesterol	Breast Cancer	Cervical Cancer	Prostate Cancer	Colon Cancer	Lung Cancer
USPTF Guideline: Gender, Age & Timeframe	All, 18+, Previous year	Male, 35+, Previous year; Female, 45+, Previous year	Female, 40-75, Previous 2 years	Female, 21-65, Previous 3 years	Not Recommended; Previous recommendation: Male, 40+, Previous two years	All, 50+, Previous 2 years	Smoker or previous smoker within past 15 years, 55-80, Previous Year

From the individual missed screening indicators, two additional variables were created. A binary indicator was created to determine if a patient was out of line with at least one USPTF recommendation. A second indicator was created to determine the proportion of screenings a patient was missing according to guidelines. In both indicators, the missed prostate screening indicator was excluded because it is no longer recommended by USPTF.

Independent Variables

Patient demographics were measured by questions that asked patient's their age, race, education and zip code. Gender was inferred from responses to the questionnaire or direct observation. Questions on income and insurance coverage were not permitted by RAM. To estimate these variables, patients' home zip codes were used to retrieve county level data from the American Community Survey (ACS).

To gauge patient's access to health care, the following variables were included: frequency of health care visits in the past year, access to a personal provider, doctor's office as a usual source of care, emergency room as a usual source of care, impact of cost on the decision to seek medical care, impact of cost on adherence to prescription medication, and a routine physical checkup in the past year. All variables were dichotomized for analysis. Health care visits were categorized into none or at least one health care visit in the past year. For the purposes of this

analysis, not visiting a health care provider in the past year was considered an indicator of low access to health care. To determine patient's self-assessed need for healthcare, they were asked to rate their own health according to the following: "excellent", "very good", "good", "fair" or "poor."

If patients were out of guidelines with at least one screening, they were asked, "Did you not receive one of the above screenings or routine check-up for any of the following reasons? Cost, unaware the screening was needed, did not think the screening was worth the cost, unsure of where to receive the screening, travel distance to receive the screening or none apply." In addition, patients were asked if they had previously received any of the preventative screenings at a RAM clinic.

D. Procedures

Surveys began the Thursday, July 17 before the clinic's opening. Patients were approached in the fairground's parking area as they waited for the clinic to open the following morning. During the clinic Friday and Saturday, surveys took place in two main waiting areas, the parking area outside of the clinic and the stadium seating within the fairgrounds. Patients surveyed in the parking area were waiting to receive tickets to enter the fairgrounds; patients in the fairgrounds stadium seating had been allowed to enter the fairgrounds, but were still waiting to complete patient registration. Patients surveyed in the stadium seating also included patients seeking cover from inclement weather. On Friday and Saturday, surveys were conducted from the clinic's opening (5:00 AM) until early evening.

Two interviewers approached patients and asked for their participation in the study. In all cases, surveys were completed according to the form provided in Appendix 2. Patients were able to read the form as the questions were asked and their subsequent responses were recorded.

E. Analysis

The analysis was split into the three parts: patient characteristics, preventative screening use and factors affecting screening use. All statistical analysis was conducted in R version 3.1.1.

i. Patient Characteristic Comparison

Patient characteristics were compared to the national population when relevant national data was available. A test of a single proportion was used to determine if responses for gender, race, education, health insurance coverage and self-rated health were statistically different from the national population. National data for gender, race, education and health insurance coverage were from corresponding US Census sources (48-51). For the self-rated health comparison and use of a routine checkup within the past year, national data was extracted from pervious analysis of BRFSS national results (52). No direct comparisons were available for the following study variables: access to a routine provider, frequency of visits in the past year, cost as a barrier for seeking medical care and prescription medication use and source of health care. A test of a single mean was conducted for household income using national data from the US Census (53).

ii. Preventative Screening Comparisons

Preventing screening rates for RAM patients were compared to national data for the following screenings: breast cancer, cervical cancer, colorectal cancer and prostate cancer. To determine statistical significance for difference in screening rates, a test of a single proportion was conducted for each screening using data from prior analysis of BRFSS at the national level (52, 54). For cervical cancer rates nationally, women 18 to 65 were included while in the study, only women 21 to 65 were asked per USPTF recommendations. Comparisons to the national population were not possible for blood pressure, blood cholesterol and lung cancer screening rates.

iii. Factors Affecting Screening Use

To understand why patients were missing screenings, I completed regressions of patient characteristics to screening indicators, and asked patients who were missing screenings the why they had missed the screening. Multi-variable regression model selection was conducted to understand which patient characteristics best correlated to each individual screening and the proportion of missed screenings. Prostate cancer screening was excluded from the model selection because it is no longer recommended. The Akaike Information Criterion (AIC) was used to incorporate a trade-off between goodness of fit and complexity of the model. In AIC model selection, models are penalized according for the number of predictors included. The model selection was started with all patient characteristics included with a few notable exceptions. Gender was excluded for the gender specific screenings, and the indicator for a health care visit in the past year was excluded from the blood pressure and blood cholesterol indicators. In addition, I calculated the percent of patients listing each self-described barrier to receiving a preventative screening.

VI. Results

A. RAM Patient Characteristics

Responses for demographic variables illustrate the low socioeconomic status for RAM patients. Education and income measures fall below the average national population. Over a quarter of patients, 27.2 percent did not graduate high school compared to just 12 percent of the national population (49). Similarly, the percent of patients, who received some education beyond high school, 19.3 percent, falls below the national average of 57.9 percent (49). The average income for the counties of RAM patients is lower than the national average. Compared to the national average of $53, 046, the average income for RAM patient counties is $36, 170 (SE=472) (53). Household incomes for RAM patients likely fall below county averages, but the county level estimates provide a conservative estimate that is indicative of the poor socioeconomic status of the surrounding region. Demographic variables for RAM patients are summarized in Table 3. All differences from the national average were statistically significant at a 99% confidence level. Within Andersen's model, these low socioeconomic indicators predispose patients to poorer health outcomes, worse health behaviors and lower access to health care.

Table 3: Comparison of Patient Demographics to the National Population

	n	Value	National Value
Female (%)	202	61.39	50.80**
White (%)	205	0.94	77.70**
Education (%)	202		
Not a high school graduate		27.23	12.56**
High school graduate		53.47	29.54**
Post high school education		19.31	58.00**
Median Household Income (SE)	205	36, 170 (472)	53000 **

Note. A test of a single mean for household income and tests of single proportions for gender, race and education were completed using published US Census data. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

RAM patients have low access to health care as measured by study variables: health care visits within the past year, cost as a barrier, having a personal provider, usual source of care and a recent routine physical checkup. Over 15 percent of patients had not seen a health care professional in the past year. Cost is a barrier to seeking health care for over two-thirds of patients, 68.14 percent, significantly higher than 10 percent at the national level (55). For adherence to prescription medication in the past 12 months, cost is a barrier for fewer patients, 44.6 percent; however, this is still a large portion of the overall patient population. Forty-one percent of patients did not have someone they considered their personal provider. Over a third listed the emergency room as a usual source of health care. Compared to the national value of 66.7 percent, under a half of RAM patients had received a routine physical checkup within the past 12 months. Table 4 summarizes the results for health care access.

Table 4: Health Care Access for RAM Patients

		n	%	National Value
Personal Provider		204	41.18	
	None			
	Only One		47.55	
	More than one		11.27	
Health care visits in past year		204		
	0		15.20	
	1 to 4		44.61	
	5 to 11		18.14	
	12		11.27	
	12+		10.78	
Cost as a Barrier	Health Care Visit	204	68.14	10.70**
	Prescription Medication Use	202	44.55	
Source of Care		204	37.07	
	Emergency Room			
	Doctor's Office		52.20	
	Hospital Outpatient Department		4.39	
	Urgent Care Center		6.34	
	Health Center		9.27	
	Other		8.29	
	No usual place		10.24	
Routine Physical checkup		204	49.51	66.70**

Note. Table 4 summarizes health care access variables for RAM patients. Tests of a single proportion were completed using published analysis of BRFSS when available. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Patient characteristics in Andersen's third category, need, indicate low health status for RAM patients. Less than half of patients rated their health as good or better compared to the national average of 66.7 percent. Table 5 summarizes patients' self-rated health status.

Table 5. Patient Health Status

	n	%	National Value
Health Status	203		
Poor		15.76	
Fair		36.95	
Good		34.98	
Very Good		10.34	
Excellent		1.97	
Good or better		47.29	85.00**

Note. Table 5 summarizes patients' self-rated health status. Test of a single proportion was completed using published analysis of BRFSS when available. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Taken together these characteristics demonstrate that RAM patients have poor socioeconomic status, low access to health care and poor health.

B. Preventative Screening Rates

RAM patients have low adherence to USPTF guidelines for all preventative screenings and rates fall below national averages for breast, cervical and colorectal cancer screenings. Close to 1 in 5 patients (16.2%) had not had their blood pressure checked within the past year by a health care professional. One-third of males age 35 and older and females age 45 and older were missing a blood cholesterol screening for the previous year. Compared to the national rate of 64.2 percent, only 43.18 percent of patients age 50 and older were within recommended guidelines for a colorectal cancer screening. Just over a half, 55.6 percent of women age 40-75 had a mammogram within the previous two years compared to 75.2 percent of the national population. Under a half (49.57%) of women age 21-65 had a Pap-test within the previous year;

a rate that's drastically lower than the national average of 81 percent. Few (13.64%) smokers or previous smokers age 55-80 had a lung cancer screening within the past year. A half of men age 40 and older had a prostate cancer screening within the past two years. With the exception of the prostate cancer screening, these rates indicate the low overall proportion of patients in accordance with USPTF screening recommendations. The national comparisons for these USPTF recommended screenings show lower adherence for screenings that is significant at a 99 percent confidence level. Table 6 summarizes the screening rates and USPTF guidelines for each screening. When these missed screenings are aggregated into a combined indicator, over a half of patients (60.98%) were missing at least one recommended screening. Overall, RAM patients on average were out of line with a third (34.45 %) of the relevant USPTF screening guidelines.

Table 6: Preventative Screening Rates

	Patients	n	%	National %
Blood Pressure	*All, 18+, Previous year*	204	83.82	
Blood Cholesterol	*Male, 35+, Previous year; Female, 45+, Previous year*	104	67.31	
Colon Cancer	*All, 50+, Previous two years*	63	43.18	64.2**
Breast Cancer	*Female, 40-75, Previous two years*	72	55.56	75.2**
Cervical Cancer	*Female,21-65, Previous three years*	105	49.57	81**
Lung Cancer	*All smokers or previous smokers within past 15 years, 55-80, Previous year*	22	13.64	
Prostate Cancer	*Men, 40+, Previous two years*	40	50.00	54.8
At Least One Missed	*Missing at least one recommended screening*	204	60.98	
Average Percent of Missed Screenings	Percent of recommended screenings missed	204	34.45	

Note. Table 6 summarizes the percent of patients in accordance with the USPTF recommendations for each screening, as well as the average percent of missed screenings and the percent of patients missing at least one screening. Tests of a single proportion were completed using published analysis of BRFSS when available to compare screening rates to the national value. Significance indicators correspond as follows: . $p<0.1$; *$p<0.05$; **$p<0.01$

C. Factors limiting preventative screening rates

i. Multi-variable models for screening use

AIC model selection identifies the best multi-variable model for screening use starting with all patient variables. The model selection results are organized by screening.

Blood Pressure

In the initial model for blood pressure screening, cost as a prohibitive factor for adherence to prescription medication, being female and a missed routine checkup are significant coefficients. Both cost of prescription medication as a barrier and being female decrease the odds ratio of a missed screening. Missing a routine checkup within the past year increases the odds ratio of not receiving a blood pressure screening.

In the final model, the number of variables included narrows from eight to four with the following: gender, cost as a barrier to medication use, access to a personal provider and a missed routine checkup. Being female, having access to a personal provider and not listing cost as a barrier to medication use all increase the odds a patient had received a blood pressure screening. Each indicator decreases the odds ratio of not receiving a blood pressure screening. These coefficients are all similar in magnitude, and drastically decrease the odds a patient was missing a screening. For example, the odds of missing a blood pressure check for a patient with a personal provider are one fifth the odds of a patient who does not have access to a provider. No routine check-up considerably increases the odds ratio of a missed blood pressure screening. The odds of a patient with a missing a blood pressure screening is 27 times higher if they also had a missed routine checkup then if they did not. Table 7 displays the regression results from the initial and final models.

Table 7. AIC Model Selection Results—Blood Pressure

	Initial (1)	Final (2)
Age	1.00	
	(1.03)	
Female	0.25**	0.25**
	(1.94)	(1.64)
Education: High School Graduate	1.09	
	(2.13)	
Post High School	1.42	
	(2.53)	
Visit in Past Year	0.03	
	(2.26)	
Personal Provider	1.20	0.21*
	(2.68)	(1.89)
Cost as a barrier: Healthcare Visit	0.83	
	(2.38)	
Medication Use	0.31**	0.21**
	(2.12)	(1.72)
Emergency Room as usual source	1.10	
	(1.97)	
Doctor's office as usual source	0.41	
	(2.58)	
Missed Routine Checkup	14.87**	26.74**
	(3.56)	(3.01)
Poor Health	2.82	
	(2.25)	
Constant	0.63	0.10*
	(7.43)	(3.04)
Observations	199	203
Log Likelihood	-37.75	-53.37
Akaike Inf. Crit.	105.51	120.74

Note. Table 7 summarizes the AIC model selection results. The odds-ratio estimates included in both the initial and final mode are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Blood Cholesterol

For a missed blood cholesterol screening, cost as a barrier and access to a personal provider are the only two significant coefficients with all variables are included. Access to a personal provider decreases the odds ratio of a missed screening while listing cost as a prohibitive factor for seeking care increases the odds ratio of a missed screening. AIC model selection narrows the number of predictors down to just cost and access to a personal provider. Patients who listed cost as a prohibitive factor are over three times as likely to have a missed screening then patients who did not. Patients with access to at least one personal provider are

close a fifth as likely as a patient without a personal provider to miss their screening. In both cases, the statistical significance of the coefficients increases from the initial to final model. Table 8 displays the regression results from the initial and final models.

Table 8. Model Selection Results—Blood Cholesterol

	Initial (1)	Final (2)
Age	0.99	
	(1.03)	
Female	1.65**	
	(1.80)	
Education: High School Graduate	0.53	
	(1.82)	
Post High School	0.60	
	(2.23)	
Personal Provider	0.18*	0.21**
	(2.68)	(2.00)
Cost as a barrier: Healthcare Visit	3.81.	3.60*
	(2.01)	(1.77)
Medication Use	1.15	
	(1.81)	
Emergency Room as usual source	1.09	
	(1.96)	
Doctor's office as usual source	0.81	
	(1.96)	
Missed Routine Checkup	1.26	
	(1.80)	
Poor Health	1.13	
	(1.77)	
Constant	1.6E12	1.5E6
	(Inf.00)	(Inf. 00)
Observations	100	104
Log Likelihood	-45.93	-49.96
Akaike Inf. Crit.	119.87	107.92

Note. This table summarizes the AIC model selection results. The odds-ratio estimates included in both the initial and final mode are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Colorectal Cancer

In the initial model for a missed colorectal cancer screening, there are no significant predictors for a missed screening. The AIC model selection decreases the number of predictors to three variables: age, a health care visit in the past year and access to a personal provider. However, none of these coefficients are statistically significant. Table 9 summarizes these results.

Table 9. Model Selection Results—Colorectal Cancer Screening

	Initial (1)	Final (2)
Age	1.06	1.09
	(1.07)	(1.06)
Female	1.08	
	(1.07)	
Education: High School Graduate	1.43	
	(2.01)	
Post High School	3.93	
	(3.93)	
Visit in Past Year	0	0
	(Inf.00)	(Inf.00)
Personal Provider	2264262302	1.6E8
	(Inf.00)	(Inf.00)
Cost as a barrier: Healthcare Visit	1.1	
	(2.32)	
Medication Use	0.68	
	(2.27)	
Emergency Room as usual source	3.78	
	(3.54)	
Doctor's office as usual source	2.97	
	(2.17)	
Missed Routine Checkup	1.99	
	(2.49)	
Poor Health	2.19	
	(2.27)	
Constant	158575.2	98625.24
	(Inf.00)	(Inf.00)
Observations	60	63
Log Likelihood	-29.38	-35.4
Akaike Inf. Crit.	84.76	78.8

Note. Table 9 summarizes the AIC model selection results. Coefficient estimates included in both the initial and final mode are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Breast Cancer

For a mammogram, only a missed routine checkup affects the odds ratio of a missed screening with statistical significance. This relationship holds in both the initial and final models. In the model selection, the number of predictors narrows to just two variables: age and a missed routine checkup. In the final model, the statistical significance of a missed routine checkup as a predictor increases from a 90 percent confidence level to a 95 percent confidence level, while the magnitude of the coefficient decreases slightly. In the final model, a woman with a missed routine checkup is close to three times more likely to miss a mammogram screening than a

woman who had a routine checkup within the past year. Table 10 summarizes the model selection results for breast cancer screening.

Table 10. Model Selection Results—Mammogram

	Initial (1)	Final (2)
Age	0.95	0.96
	(1.03)	(1.03)
Education: High School Graduate	2.04	
	(1.84)	
Post High School	2.62	
	(2.24)	
Visit in Past Year	0	
	(Inf.00)	
Personal Provider	1.84	
	(2.58)	
Cost as a barrier: Healthcare Visit	0.89	
	(1.97)	
Medication Use	1.03	
	(1.95)	
Emergency Room as usual source	0.73	
	(2.05)	
Doctor's office as usual source	1.09	
	(2.08)	
Missed Routine Checkup	3.11.	2.90*
	(1.92)	(1.66)
Poor Health	2.14	
	(1.87)	
Constant	11822762	4.06
	(Inf.00)	-4.58
Observations	70	72
Log Likelihood	-41.62	-46
Akaike Inf. Crit.	109.25	98.01

Note. Table 10 summarizes the AIC model selection results. The odds-ratio estimates included in both the initial and final mode are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Cervical Cancer

In the initial model for cervical cancer screening, there are no significant predictors of screening use. The final model includes age, access to a personal provider and a visit to a health professional in the past year. Older age subtlety increases the odds ratio of a missed screening. Older women are 1.07 times as likely to miss their screening as younger women. Both access to a personal provider and health care visits in the past year decrease the odds ratio of a missed pap test with statistical significance. A woman who had visited a health care professional in the past

year is three-tenths as likely to miss their screening as a woman who had seen a health care professional. Similarly, a woman with access to more than one personal provider is one-fifth as likely to miss the pap screening as a woman who does not have access to a personal provider. Table 11 displays the results for cervical cancer screening.

Table 11. Model Selection Results—Pap Test

	Initial (1)	Final (2)
Age	1.06	1.07**
	(1.02)	(1.02)
Education: High School Graduate	0.53	
	(1.77)	
Post High School	1.03	
	(1.9)	
Visit in Past Year	0.25	0.28*
	(2.43)	(2.09)
Personal Provider	0.41	0.32 .
	(1.99)	(1.73)
Cost as a barrier: Healthcare Visit	2.52	
	(1.79)	
Medication Use	0.82	
	(1.76)	
Emergency Room as usual source	1.05	
	(1.73)	
Doctor's office as usual source	0.9	
	(1.8)	
Missed Routine Checkup	0.75	
	(1.72)	
Poor Health	1.62	
	(1.68)	
Constant	0.27	0.3
	(3.47)	(2.44)
Observations	103	105
Log Likelihood	-60.47	-64.63
Akaike Inf. Crit.	146.94	137.27

Note. Table 11 summarizes the AIC model selection results. The odds-ratio estimates included in both the initial and final mode are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Lung Cancer

Given the very low number of patients who had received a lung cancer screening, a multi-variable regression model is not appropriate to analyze use of this screening. Only 3 of 22 relevant patients had received the screening. As a result, all patient responses predict a missed screening and the multi-variable regression models do not converge.

Proportion of Missed Screenings

In the initial model, age, receiving a routine checkup and a health care visit in the past year all correlate to the proportion of missed screenings for a patient. Age and a missed routine checkup positively correlate while a visit in the past year negatively correlates. Age and a health care visit in the past year are significant at a 99.9 percent confidence level. In the final model, the AIC model selection narrows the number of predictors to just age, a visit in the past year, the poor health indicator and a missed routine checkup. Patients who visited a health care professional in the past year are missing fewer of the preventative screenings that apply to them specifically. Both age and a missed routine checkup positively correlate to the proportion of missed screenings. Older patients and those who did have a routine checkup in the past year are more likely to miss a higher proportion of their preventative screenings. Table 12 summarizes the regression results from the initial and final models.

Table 12. Model Selection Results- Proportion of Missed Screenings

	Initial (1)	Final (2)
Age	0.01**	0.01**
	(0.002)	(0.002)
Female	0.02	
	(0.04)	
Education: High School Graduate	0.01	
	(0.05)	
Post High School	0.05	
	(0.06)	
Visit in Past Year	-0.56**	-0.57**
	(0.07)	(0.06)
Personal Provider	-0.0002	
	(0.06)	
Cost as a barrier: Healthcare Visit	0.04	
	(0.05)	
Medication Use	0.004	
	(0.05)	
Emergency Room as usual source	-0.05	
	(0.05)	
Doctor's office as usual source	-0.05	
	(0.05)	
Missed Routine Checkup	0.09.	0.12*
	(0.05)	(0.04)
Poor Health	0.07	0.06

	(0.05)	(0.04)
Constant	0.41** (0.12)	0.42** (0.09)
Observations	199	203
R2	0.40	0.35
Adjusted R2	0.35	0.34
Residual Std. Error	0.29 (df = 184)	0.29 (df = 198)
F Statistic	8.61*** (df = 14; 184)	27.14*** (df = 4; 198)

Note. Table 1Table 12 summarizes the AIC model selection results. The coefficient estimates included in both the initial and final models are shown. Significance indicators correspond as follows: . p<0.1; *p<0.05; **p<0.01

Aggregated Results of AIC Model Selection

Taken together, the aggregated results indicate the importance of a healthcare visit within the past year, age, access to a personal provider and a missed routine checkup as each variable is significant in at least two of the final models. A visit to a healthcare profession within the past year negatively correlates to the proportion of missed screenings and decreases the odds ratio of a missing a cervical cancer screening. Age positively correlates to the proportion of missed screenings and increases the odds ratio for missing the cervical cancer screening. Access to a personal provider corresponds to decreased odds ratios of a missed blood pressure, blood cholesterol and cervical cancer screening. Not having a routine checkup in the past year positively correlates to the proportion of missed screenings corresponds to increased odds ratios for missed blood pressure and breast cancer screenings. Notably absent in the in all screening models are the effect of education level and self-rated health. Similarly, cost as a barrier to health is a predictor in only one of the final models. Figure 1Figure 6 summarizes the direction and significance for each patient variable for all the screenings.

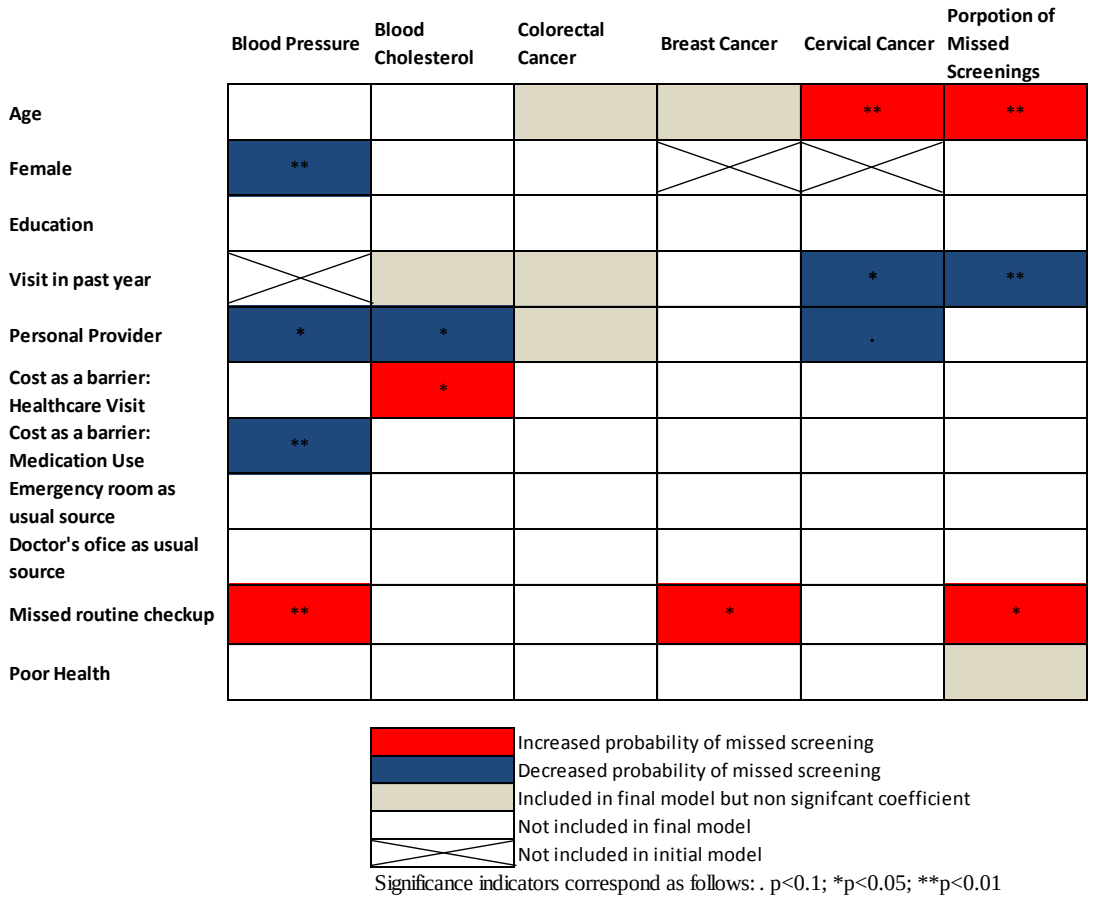


Figure 6. Summary of Regression Models

Further context of screening use

Cost was the most commonly cited reason a patient did not receive a screening. Ninety-four patients (46.53%) listed cost as a barrier. Close to 1 in 8 patients stated that travel was a factor leading them to not receive a clinical screening. Patients were also both unaware the screening was needed and unsure of where to receive the screening. Just under ten percent of patients were unaware the screening was needed, and 6.93 percent of patients were unsure of where to receive the screening. Table 13 summarizes the self-described barriers to preventative services. In addition, patients were asked if they had ever received a preventative screening at any RAM clinic. Only 1 in 5 patients had ever done so.

Table 13. Reasons for Missed Screening

Reason for missed screening	n	%
Cost	94	46.53
Unaware screening was needed	20	9.90
Unsure of where to receive screening	14	6.93
Travel	26	12.87
No Reason	8	3.96
None apply	33	16.34

D. Sample Bias Concerns

To help address concerns for selection bias within the Wise Clinic, patient data were compared between sample and clinic data when possible. This comparison was conducted for patient age, zip code, race and visits to a health care professional within the past year. No statistically significant difference exists between the mean age for the sample size and the overall clinic population aged 18 and older. Similarly, zip code data for sample and clinic populations do not reveal any key distinctions. A side-by-side comparison found in Appendix 1 shows that more zip codes are represented in the clinic data; however, this would be expected given the larger count of observations and high number of zip codes being represented by just a few patients. Importantly both show that the same counties immediately surrounding the clinic have the largest patient representation.

A chi-squared goodness of fit test for all race classifications potentially sampled (White, Black, Hispanic, Asian, Native American and Other) reveals a discrepancy between the sampled population and the clinic-wide population. However, this result is not unexpected, given the low counts of Hispanic, Asian and Native American respondents at the clinic. For example, under sampling of the 15 Hispanic patients out of 2,244 could be expected given the low probability of encountering these patients. When the same test is repeated for a classification of white and all

other races, there is no difference between the sample and clinic population. Similarly, a chi-squared goodness of fit test indicates that the sampled patient population does not have lower access to care than the overall clinic population as measured by the number of patients who reported seeing a health care professional in the past year. In fact, the test shows that a bias exists in the opposite direction, sampled patients have better access. Overall a comparison between the sample and overall patient population for age, zip code, race and access to a health care professional within the past year helps remove concerns for sample bias.

E. Limitations and Implications for Further Research

Several limitations on the data and collection procedures are worth highlighting. First, these results are based off of patient-reported data, which could be inaccurate. For example, patients may have trouble recalling the last time they received a preventative screening, which would subsequently affect whether or not they were missing the screening according to USPTF guidelines. Access to electronic medical records for patients in the region could prove to be a more reliable data source in future research. However given that a majority of the survey questions have been previously validated at the national level, the reliance on patient reported data should not be considered a severe limitation. Second, non-random sampling was conducted. While selection bias could skew the data presented in this thesis, the comparison between sample and clinic-wide data suggests that no such bias exists. Incorporating these questions with the data the clinic collects on all patients would eliminate this cause for concern. Lastly, information on patients' health insurance coverage and income was not collected. While these two variables are important factors affecting access to health care, the organizers of the RAM clinic prohibited these survey questions. Future inclusion of this data would provide a more complete understanding of the patients attending RAM.

VII. Discussion

Over the course of three days, 205 surveys were conducted at the RAM Clinic in Wise County, Virginia in order to understand preventative screening rates and factors affecting use for medically underserved patients in Central Appalachia. Screening rates according to USPTF guidelines were calculated from patient responses, and these rates were compared to national values. Patient demographic and health care access variables were used to understand why patients were missing screenings. The implications of low screening rates, role for health care reform to improve screening rates and recommendations for the RAM Clinic are discussed in the subsequent sections. While general policy connections are made in Section A, the specific connection of these findings to health policy, specifically health care reform, are detailed in section B.

A. Implications of Low Screening Rates

Low preventative screening use for RAM patients highlights the need for policy interventions. In total, over half of patients were missing at least one recommended screening, and on average patients were missing a third of recommended screenings. When compared to national averages, the low screening rates combined with existing mortality disparities and the established benefits of early screening demonstrate the need and potential for policy to improve regional preventative services use.

i. Cervical Cancer

Among all the studied screenings, the low screening rates for cervical cancer and proven effectiveness make the Pap test a priority for action. Since the introduction and the use of Pap testing in the 1950s, cervical cancer incidence has decreased dramatically and mortality has

fallen by 75 percent (20). Almost all cervical cancer incidence and mortality can be avoided with proper screening (20, 21). Yet, only half of RAM patients had the screening compared to 81 percent of the national population (52). These low rates may help explain the region's high incidence of cervical cancer mortality (20).

Low cervical cancer screening use is considered a broader indicator of low health care access (20). The multi-level regression model selected according to AIC criteria reinforces this national understanding. For RAM patients, access to a personal provider and a visit to a health care professional all decrease the odds that a woman was missing a recommended Pap test. Similarly at a national level, women without a regular health care provider are less likely to receive a screening (56). The final regression model shows a previously undiscussed factor at the national level: age. Older female patients were more likely to have missed their Pap test when compared to younger patients. While the effect of age was small (the odds of an older woman missing the screening were ten percent higher than younger women) the increased odds ratio was significant at a 99.9 percent confidence level. This effect could be due to the increased likelihood that older women had previously received a hysterectomy. Pap-tests would no longer be recommended for these women. Since women were not asked if they had received a hysterectomy, this possible bias could explain the effect of age. Regardless, the effect access to a personal provider and a healthcare visit in the past year indicate that policies to increase access to health care such as provision of health insurance could improve these screening rates.

ii. Colorectal Cancer

Among RAM patients, the colorectal screening rate is 43.2 percent, just over 20 percentage points lower than the national population (52). Again, these results should cause concern given both the screening's effectiveness and the region's existing disparity for colorectal

cancer mortality. Estimates show 60 percent of deaths from colorectal cancer could be prevented with proper screening and treatment (22). As a result, the low screening results could explain the region's high rates of colorectal cancer mortality. The results from the multi-level regression do not provide useful information for policies to improve screening attainment. From the patient responses, the doctor's office as a regular source of care increases the odds of a missed screening, a counterintuitive result. When this variable is removed from the model selection, there are no significant coefficients for patient variables. While these results do not provide a useful explanation of why patients are missing their colorectal screening, research at the national level demonstrates the importance of education, health insurance and a usual source of care (22). As such, policies to extend health insurance coverage could increase screening use; however, simple provision of insurance would not address the role of education level. These national findings can inform policy to improve screening rates.

iii. Breast Cancer

The mammogram screening rate of 55.6 percent is a little less than 20 percentage points lower than the national rate of 75.2 percent (52). Women from Central Appalachia die from breast cancer at higher rates than the national population (20). At the national level, mammogram screening has likely contributed to the decrease in breast cancer mortality. Estimates attribute ten percent of the mortality decline from 1975-2000 to proper screening alone (23). For RAM patients, a previous routine check-up within the past year best predicts mammogram use. Women who had not had a routine checkup in the past year are almost three times more likely to have missed their mammogram. At the national level, health insurance has been shown to predict mammogram screening use, but since questions on insurance coverage were prohibited by clinic organizers, it is unknown whether the same holds true for RAM patients (34). Given that a

routine checkup is a basic indicator of healthcare access, policy changes to increase access to health care such as provision of health insurance could foreseeably improve these screening rates.

iv. Blood Pressure and Blood Cholesterol

Sixteen percent of patients had not had their blood pressure checked by a healthcare professional in the past year. Blood pressure checks are routine for almost all clinical encounters. As a result, the screening rate is a proxy for patients who have visited a health care professional in the past year. Unfortunately, no comparison to the national population is available. Thirty-three percent of patients were not within the guidelines for blood cholesterol. Together these rates are unacceptably high given the region's mortality disparity for heart disease and the utility of these screenings to identify at risk patients. Access to health care indicators predicted both screening rates. Patients without a routine checkup in the past year are more likely to miss their blood pressure screening while patients who listed cost as a barrier to care are more likely to miss their blood cholesterol screening. For both, access to a personal provider lowers the odds of a missed screening. Provision of health insurance would address access to a personal provider, and as a result improve screening rates.

v. Lung Cancer

So few RAM patients had received a lung cancer screening that all patient variables perfectly predict a missed screening. Just 3 of 22 previous smokers age 55-80 were screened for lung cancer within the past year. This result clearly indicates a need to improve screening in a region where patients die disproportionately from lung cancer compared to the national population.

vi. Combined Screening Indicators

Basic access to health care is a powerful predictor of the missed proportion of screenings. Patients who visited a health care professional in the past year missed a fewer proportion of screenings. Patients who had a routine check-up missed a fewer proportion of screenings. While older patients were more likely to have missed a higher percent of screenings, this result should be qualified with an understanding that older patients may be more likely to miss a higher proportion purely because they have more screenings to possibly miss. These results, in particular the impact of at least one visit, have important implications for policy action. The results suggest that having patients at least see one provider could be enough to improve overall adherence to preventative health measures. A policy to extend health insurance coverage would improve access to a personal provider, increase the likelihood of a visit with a health care professional and therefore improve overall screening rates.

B. Connection to Health Care Reform

i. Coverage under the Affordable Care Act

These thesis results clearly indicate the need for policy to improve preventative screening rates. The Affordable Care Act (ACA), passed in 2010, prioritizes preventative services to improve health outcomes and reduce healthcare costs. The legislation impacts preventative health use in two key forms.

First, the law mandates full coverage of preventative services for private insurance plans and Medicare, and incentivizes full coverage for state Medicaid plans. For this thesis, health insurance coverage is broadly divided into three categories: private, Medicaid and Medicare. Private health insurance plans must provide coverage for all the preventative screenings addressed in this thesis with the exception of the prostate cancer screening (57). This rule

excludes “grandfathered” plans that existed prior to March 2010 and whose coverage policies have not changed significantly since then; however, it’s expected that over time all “grandfathered” plans will eventually lose their exempt status (57). According to ACA stipulation, Medicare now provides full coverage for the studied preventative screenings, excluding the prostate screening. The ACA does not have the authority to require state Medicaid plans; however, the law incentivizes full coverage of these services by providing increased federal funding. Medicaid coverage differs among the four states representing RAM patients. Tennessee and West Virginia provide full coverage whereas Kentucky and Virginia do not (58). For Virginia, these screenings require three dollar copayments. In Kentucky, Medicaid does not require copayments for breast and cervical screenings, but does for colorectal, blood pressure and blood cholesterol screenings (58).

Second, the ACA will impact screening rates by expanding insurance coverage. For RAM patients, this coverage expansion primarily occurs either through federal insurance subsidies and Medicaid expansion. Both Medicaid expansion and federal health subsidies have extended coverage in Kentucky and West Virginia (59). For Tennessee and Virginia where Medicaid expansion has not occurred, a coverage gap exists for low income adults (60). Their income levels fall below levels for federal health subsidies but without Medicaid expansion, they remain uncovered.

ii. Can rates be improved?

These provisions of the ACA have and likely will continue to increase preventative screening usage for RAM patients and underserved patients of Central Appalachia. First, the removal of copayments for private plans and Medicare and the incentives for Medicaid plans will help remove remaining cost barriers for these screenings. Close to a half of patients listed that

cost of the screening was the reason they had not received missed screenings. Presumably, rates would increase for newly insured patients because this cost has almost been completely removed.

Secondly and more importantly, ACA will improve screening rates by increasing health insurance coverage for these underserved patients. The Oregon Health Insurance Experiments provides evidence the assumption that simple provision of health insurance may be enough to improve use of preventative services (61). In a randomized control trial, patients who received Medicaid accessed the preventative screenings more than the control group for all the screenings relevant to this thesis with the exception of the colorectal screening. The study indicates that even amidst the other constraining socioeconomic conditions, including low education and transport barriers, insurance coverage alone is enough to improve screening rates. While colorectal screening rates did not improve in the Oregon study, an uptake in colorectal screening was observed in Massachusetts following its state health care reform in 2006 (62). Both cases support my findings which highlight the importance of access to a routine provider and at least one health care visit within the past year for aggregated screening use. Expanded insurance coverage would address both factors contributing to lower screening.

While Medicaid expansion has not occurred in Virginia and Tennessee, federal health subsidies for low-income individuals would still increase insurance coverage for the region. Patient zip code data additionally provides anecdotal support for Medicaid expansion in both states. Figure 5 shows that patients are overwhelmingly from Tennessee and Virginia and there are few to no patients from Kentucky and West Virginia, despite the fact that Kentucky, West Virginia and Tennessee residents are close to equidistant from the clinic. While Kentucky and West Virginia have expanded Medicaid, Tennessee has not. This geographic pattern suggests

that Medicaid expansion would not only improve screening rates by increasing insurance coverage, but could lower overall demand for the RAM clinic.

C. Role for RAM

Currently patients arrive at RAM with low preventative screening rates and leave with the same low rates because they are not utilizing the clinic's available preventative services. RAM's actions to improve the current situation can be broadly categorized into either the provision of screenings at the clinic or the strengthening of patient awareness of the resources available to receive screenings outside of RAM.

i. Improve screening at RAM

While the clinic does provide preventative services, only 1 in 5 patients had ever received a screening at any previous RAM clinic. Efforts to increase preventative service use at RAM could be successful given the reasons patients provided for not having a screening: unsure of where to receive screenings, unaware of the need for a screening or prohibited from receiving a screening by cost. In total, these responses were listed by close to two-thirds of RAM patients. Screenings at RAM would be at no cost to the patient, and effective education efforts during the clinic could raise awareness of the need for and availability of these screenings. With this said, there are two limitations to providing screenings at the RAM Wise clinic.

First, patients primarily use the RAM clinic to receive care for acute medical, dental and vision concerns. It may prove too difficult to prioritize preventative services in light of these acute needs. Getting patients to focus on preventative service needs at the RAM clinic, could be related to doing the same at an emergency room or urgent care center.

Second, there are ethical concerns on completing these screenings for patients without ensured access to follow-up care. Would it be appropriate to give a patient a positive result for

colorectal cancer knowing that at the end of the clinic they still have lack access to a health care provider? This concern is partially mitigated by practices established by the University of Virginia Healthcare System's Mobile Mammography Unit. Patients who need a follow-up appointment after their mammogram receive an appointment at the UVA Healthcare System. Efforts to ensure adequate follow-up care would be needed for all the screenings.

ii. Education strategies to improve screening outside of RAM

Even if patients continue to leave RAM without utilizing the preventative health services, the clinic provides an opportunity to educate patients on health care reform and its impact on the availability of preventative services. RAM could have the biggest impact by having trained ACA navigators available at the clinic to provide information on enrollment eligibility and answer questions concerning the online exchanges. While enrollment is not available during July when the clinic occurs, these navigators could still help patients prepare for the upcoming enrollment period in the fall. Other volunteers to educate patients on the ACA's impact on coverage for preventative services could improve screening outside of the clinic. All Medicare patients should be reminded of the full coverage of preventative services and encouraged to take advantage of these free screenings. Patients with private health insurance should be reminded of the likelihood that their plan provides full coverage.

Until Medicaid expansion occurs, there will continue to be a portion of the RAM patients for which neither Medicaid, Medicare nor private insurance practices apply. For these patients, RAM will continue to be a critical source not only for health care, but also for health education. And for close to a quarter of the patients whose sole, annual encounter with health care professionals is RAM, they can be made aware of the resources available for screenings. For women who still lack insurance coverage and fall within program guidelines, the National Breast

and Cervical Cancer Early Detection Program (NBCCEDP) can provide cervical and breast cancer screenings at no cost. The Health Wagon, a local non-profit health organization, also serves a community resource for these underserved patients to receive these recommended screenings. RAM can improve these rates by concentrated efforts to educate patients on the availability of these screenings through health care reform and other existing programs for uninsured patients.

VIII. Conclusion

Low screening rates combined with the existing mortality disparities and established benefits of early screening demonstrate the need and potential of health care policy to improve regional preventative services use. The low rates observed for RAM patients matches previous research within the region (14, 39, 41-45). Of all the screenings, low rates for cervical, breast and colorectal cancer warrant policy attention given the substantial benefits of proper screening and the region's mortality disparities for these cancers. Results also indicate correlations between low health care access variables and low screening rates. Regression model selection demonstrates the importance of access to a personal provider, a health care visit in the past year and completion of a routine checkup as predictors of screening use. Additionally, patients listed cost as the primary reason they had not received a preventative screening.

These findings connect to ongoing health care reform in two key forms. First, the Affordable Care Act addresses the factors correlated to low screening use in this study by extending health insurance coverage through federal health subsidies and requiring full coverage for the included preventative health screenings. Second, the results support Medicaid expansion in Tennessee and Virginia as a way to improve preventative health. A primary goal of Medicaid expansion is to extend coverage in order to increase health care access and improve health outcomes. Results show that current preventative services use correlates to low health care access which may help explain the region's existing disparities. Medicaid expansion would undoubtedly improve the status quo for these medically underserved patients. In addition, patient zip code maps show few patients from states with Medicaid expansion despite geographic proximity to the clinic.

Finally, these results provide two paths forward for the RAM clinic. First, RAM could prioritize getting patients screening at the clinic as long as patients remain uninsured. Currently, patients do not utilize the preventative services available at the clinic, and this should be considered a missed opportunity because for many patients RAM is their primary source of health care and only potential source of preventative screenings. Second, the results show the importance for RAM to educate patients on the impact of health care reform on preventive health services. Not only is RAM an opportunity for patients to learn about enrollment through the healthcare exchange, but patients could learn about the full coverage for preventative services under the law's provisions.

VII. References

1. Remote Area Medical. Remote Area Medical Wise Clinic: Recap of Patient Care. 2014.
2. Remote Area Medical. Remote Area Medical 2014. Available from: http://www.ramusa.org/

3. Halverson J, Ma L, Harner E. An analysis of disparities in health status and access to health care in the Appalachian region. Washington, DC: Appalachian Regional Commission; 2004.
4. Mary Babb Randolph Cancer Center. Underlying socioeconomic factors influencing health disparities in the Appalachian region. In: Research OfSEaH, editor. Morgantown, WV: Department of Community Medicine, Robert C. Byrd Health Sciences Center, West Virginia University; 2008.
5. PDA Inc. Health Care Costs and Access Disparities in Appalachia. In: Hill TCBSCfHSRUoNCC, editor. Washington, DC: Appalachian Regional Commission; 2012.
6. Halverson JA, Friedell GH, Cantrell ES, Behringer BA. Health Care Systems. Appalachian Health and Well-Being. 2012:89-108.
7. Hendryx M. Mortality rates in Appalachian coal mining counties: 24 years behind the nation. Environmental Justice. 2008;1:5-11.
8. Hendryx MS. Health and the Physical Environment. Appalachian Health and Well-Being. 2012:47-66.
9. Knight EA. The Quest for an Appalachian Health Lifestyle. Appalachian Health and Well-Being. 2012:67-88.
10. Thoenen E. Health Risks: The Appalachian Lifestyle. In: West Virginia Department of Health and Human Resources HSC, editor. Charlestown, WV: West Virginia Department of Health and Human Resources; 1995.
11. Fisher J, Engelhardt H, Stephens J, Smith B, Haydu G, Indian R, et al. Cancer-related Disparities among Residents of Appalachia Ohio. Journal of Health Disparities Research and Practice. 2008;2:61-74.
12. Shell R, Tudiver F. Barriers to cancer screening by rural Appalachian primary care providers. Journal of Rural Health. 2004;20:368-73.
13. Schoenberg NE, Hopenhayn C, Chrsitian A, Knight EA, Rubio A. An in-depth and updated perspective on determinants of cervical cancer screening among central Appalachian women. Women & health. 2005;42(2):89-105.
14. Hall HI, Uhler RJ, Coughlin SS, Miller DS. Breast and cervical cancer screening among Appalachian women. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology. 2002;11(1):137-42.
15. Davis RE, Armstrong DK, Dignan M, Norling GR, Redmond J. Evaluation of educational materials on colorectal cancer screening in Appalachian Kentucky. Preventing chronic disease. 2006;3(2):A43.
16. Leslie NS, Deiriggi P, Gross S, DuRant E, Smith C, Veshnesky JG. Knowledge, attitudes, and practices surrounding breast cancer screening in educated Appalachian women. Oncology nursing forum. 2003;30(4):659-67.
17. Tessaro I, Mangone C, Parkar I, Pawar V. Knowledge, barriers, and predictors of colorectal cancer screening in an Appalachian church population. Preventing chronic disease. 2006;3(4):A123.
18. Lyttle NL, Stadelman K. Assessing awareness and knowledge of breast and cervical cancer among Appalachian women. Preventing chronic disease. 2006;3(4):A125.
19. National Institutes of Health. NIH Strategic Research Plan and Budget, Fiscal Years 2009-2013. Vol. I. Fiscal Years 2009-2013. In: Services USDoHaH, editor. Washington, DC2009.
20. Freeman H, Wingrove B. Excess Cervical Cancer Mortality: A Marker for Low Access to Health Care in

Poor Communities. In: National Cancer Institute CtRCH, Disparities, editors. Rockville, MD2005.
21. U.S. Heatlh Resources Service Administration. Cervical Cancer Screening. In: Services DoHaH, editor. 2014.
22. U.S. Health Resources and Services Administration. Colorectal Cancer Screening In: Services DoHaH, editor. 2014.
23. Berry DA, Cronin KA, Plevritis SK, Fryback DG, Clarke L, Zelen M, et al. Effect of screening and adjuvant therapy on mortality from breast cancer. The New England journal of medicine. 2005;353(17):1784-92.
24. Appalachian Health and Well-Being. Ludke RL, Obermiller PJ, editors. Lexington: Univ Press Kentucky; 2012. 1-386 p.
25. Woolf SH, Johnson RE, Geiger HJ. The rising prevalence of severe poverty in America: a growing threat to public health. American journal of preventive medicine. 2006;31(4):332-41.
26. Woolf SH, Johnson RE, Phillips RL, Jr., Philipsen M. Giving everyone the health of the educated: an examination of whether social change would save more lives than medical advances. American journal of public health. 2007;97(4):679-83.
27. Marmot M, Wilkinson R. Social Determinants of Health. 2nd ed. ed. Oxford, K: Oxford University Press; 2006.
28. Bureau of Health Professions. Area resource file (ARF). In: U.S. Department of Health and Human Services HRaSA, Bureau of Health Professions, editor. Rockville, MD2005.
29. McCracken AL, Firesheets EK. The Heart of Appalachia. Appalachian Health and Well-Being. 2012:111-27.
30. Ramsey P, Glenn L. Risk Factors for Heart Disease in Rural Appalachia. Family and Community Health. 1998;20(4).
31. American Heart Association. Why Blood Pressure Matters. 2014.
32. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? Journal of health and social behavior. 1995;36(1):1-10.
33. Andersen RM. National health surveys and the behavioral model of health services use. Medical care. 2008;46(7):647-53.
34. Ahluwalia IB, Bolen J, Garvin B. Health insurance coverage and use of selected preventive services by working-age women, BRFSS, 2006. Journal of women's health (2002). 2007;16(7):935-40.
35. Okoro CA, Strine TW, Young SL, Balluz LS, Mokdad AH. Access to health care among older adults and receipt of preventive services. Results from the Behavioral Risk Factor Surveillance System, 2002. Preventive medicine. 2005;40(3):337-43.
36. Carlos RC, Underwood W, 3rd, Fendrick AM, Bernstein SJ. Behavioral associations between prostate and colon cancer screening. Journal of the American College of Surgeons. 2005;200(2):216-23.
37. Shapiro JA, Seeff LC, Thompson TD, Nadel MR, Klabunde CN, Vernon SW. Colorectal cancer test use from the 2005 National Health Interview Survey. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology. 2008;17(7):1623-30.
38. Ross LE, Berkowitz Z, Ekwueme DU. Use of the prostate-specific antigen test among U.S. men: findings from the 2005 National Health Interview Survey. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology. 2008;17(3):636-44.
39. Tarasenko YN, Fleming ST, Schoenberg NE. The relationship between perceived burden of chronic conditions and colorectal cancer screening among Appalachian residents. The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association. 2014;30(1):40-9.

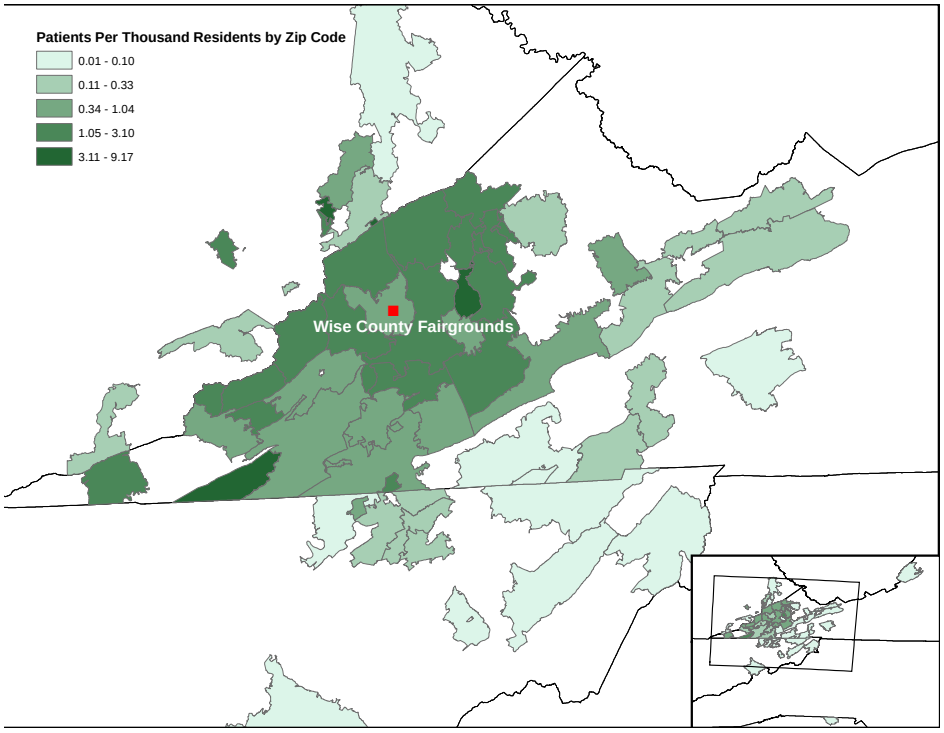
40. Elnicki DM, Morris DK, Shockcor WT. Patient-perceived barriers to preventive health care among indigent, rural Appalachian patients. Archives of internal medicine. 1995;155(4):421-4.
41. Behringer B, Friedell G, Dorgan K, Hutson S, Naney C, Phillips A, et al. Understanding the challenges of reducing cancer in Appalachia: Addressing a place-based health disparity population. California Journal of Health Promotion. 2007;5:40-9.
42. Deskins S, Harris CV, Bradlyn AS, Cottrell L, Coffman JW, Olexa J, et al. Preventive care in Appalachia: use of the theory of planned behavior to identify barriers to participation in cholesterol screenings among West Virginians. The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association. 2006;22(4):367-74.
43. Enlicki D, Morris DK, Shockcor WT. Patient-perceived barriers to preventive health care among indigent, rural Appalachian patients. Archives of internal medicine. 1995;155(4):421-4.
44. Behringer B, Mabe KH, Dorgan KA, Hutson SP. Local implementation of cancer control activities in rural Appalachia, 2006. Preventing chronic disease. 2009;6(1):A34.
45. Dignan M, Han D, Johnson O. Does Distance Matter? Distance to Mammography Facilities and Stage at Diagnosis of Breast Cancer in Kentucky. . Journal of Rural Health. 2009;25(4):366-71.
46. Adams PE, Martinez ME, Vickerie JL, Kirzinger WK. Summary health statistics for the U.S. population: National Health Interview Survey, 2010. Vital and health statistics Series 10, Data from the National Health Survey. 2011(251):1-117.
47. U.S. Preventative Services Task Force. Published Recommendations. In: Force USPST, editor. 2014.
48. Howden LM, A. MJ. Age and sex composition: 2010. In: US Department of Commerce EaSA, editor. 2010.
49. U. S. Census Bureau. Educational Attainment, Current Population Survey (CPS) In: Bureau USC, editor. 2013.
50. U.S. Census Bureau. Health Insurance in the United States: 2013 (P60-250). In: Bureau USC, editor. 2013.
51. US Census Bureau. U.S. Census Bureau: State and County Quick Facts. In: Bureau USC, editor. 2014.
52. Xu F, Town M, Balluz LS, Bartoli W, Murphy W, Chowdhury P, et al. Surveillance for Certain Health Behaviors Among States and Selected Local Areas — United States, 2010. In: Division of Behavioral Surveillance OoS, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention, editor. 2013.
53. Noss A. Household Income: 2012; American Community Survey Briefs. In: BUREAU USC, editor. 2013.
54. Hughes E, Kilmer G, Brown J, Colclough G, Geathers S, Roberts HE-E, L. , et al. Surveillance for Certain Health Behaviors Among States and Selected Local Areas --- United States, 2008. In: Division of Behavioral Surveillance PHSPOP, Office of Surveillance, Epidemiology and Laboratory Services (OSELS), Centers for Disease Control and Prevention, editor. 2010.
55. Nelson DE, Powell-Griner E, Town M, Kovar MG. A comparison of national estimates from the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. American journal of public health. 2003;93(8):1335-41.
56. Benard VB, Thomas CC, King J, Massetti GM, Doria-Rose VP, Saraiya M. Vital signs: cervical cancer incidence, mortality, and screening - United States, 2007-2012. MMWR Morbidity and mortality weekly report. 2014;63(44):1004-9.
57. Kaiser Family Foundation. Fact Sheet: Preventative Services Covered by Private Health Plans under the Affordable Care Act. In: Foundation KF, editor. 2014.
58. Gates A, Ranji U, Snyder L. Coverage of Preventive Services for Adults in Medicaid. Kaiser Family Foundation; 2014.

59. Kaiser Family Foundation. Status of State Action on the Medicaid Expansion Decision. Kaiser Family Foundation2014.
60. Garfield R, Damico A, Stephens J, Rouhani S. The Coverage Gap: Uninsured Poor Adults in States that Do Not Expand Medicaid – An Update. Kaiser Family Foundation

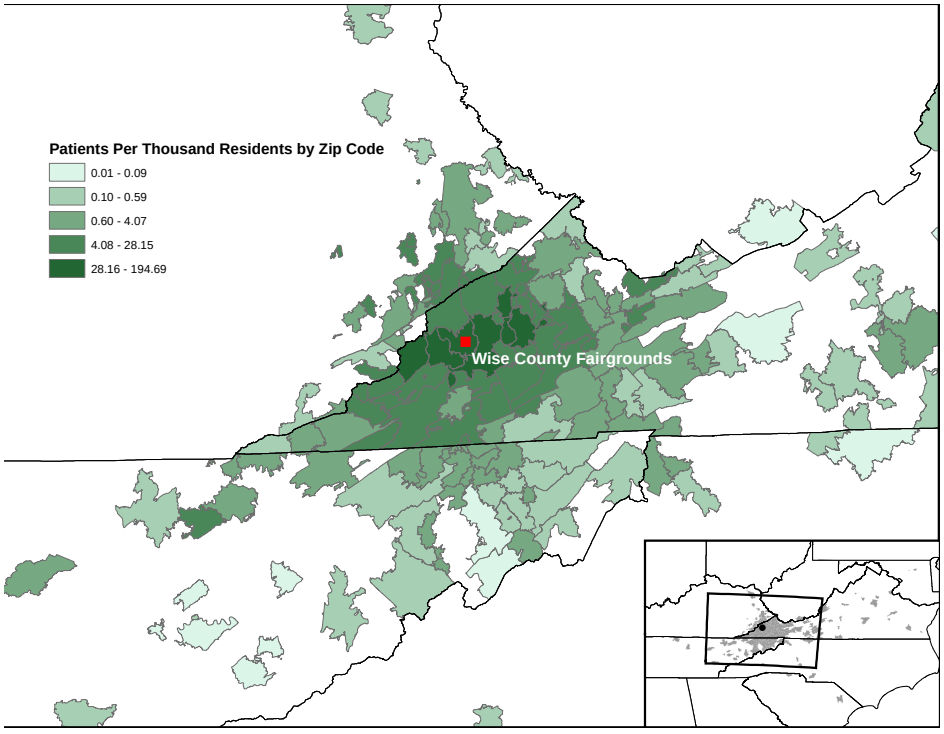
2014.
61. Baicker K, Taubman SL, Allen HL, Bernstein M, Gruber JH, Newhouse JP, et al. The Oregon experiment--effects of Medicaid on clinical outcomes. The New England journal of medicine. 2013;368(18):1713-22.
62. Van Der Wees PJ, Zaslavsky AM, Ayanian JZ. Improvements in health status after Massachusetts health care reform. The Milbank quarterly. 2013;91(4):663-89.

Appendix 1: Clinic and Sample Comparison of Patients' Zip codes

Sample-wide: Patients Per Thousand Residents by Zip Code



Clinic-Wide: Patients per Thousand Residents by Zip Code



Appendix 2: Survey Form

Preventative Screening Use: RAM Clinic at Wise

Date: __/__ #: _____ Surveyor: _____

What is your age? ____

What would you say is your race?

White Black Hispanic Asian Native American

What is the highest grade or year of school you completed?

None Elementary Some high school High school graduate College

What is the zip code where you live? _____

Would you say that in general your health is…?

Excellent Very good Good Fair Poor

How many times have you been to a doctor, nurse, or other health professional in the past 12 months? _____

How many of these visits were through Remote Area Medical (RAM), Health Wagon or a similar free health clinic? _____

If you saw a doctor in the last 12 months, what health concern brought you to the doctor?

Routine checkup Need of preventative screening Emergency medical need
Chronic health issue

When you are sick or need advice about your health, to which one of the following places do you usually go?

Would you say:

Doctor's office	Public health clinic	Hospital outpatient department	Hospital emergency room	Urgent care center	Some other kind of place	No usual place

Do you have one person you think of as your personal doctor or health care provider?

Yes only one Yes more than one No

Was there a time in the past 12 months when you needed to see a doctor but could not because of cost? (Y/N)

Have you delayed getting needed medical care for any of the following reasons in the past 12 months? Select the most important reason.

You couldn't get through on the telephone.	You couldn't get an appointment soon enough.	Once you got there, you had to wait too long to see the doctor.	The (clinic/doctor's) office wasn't open when you got there.	You didn't have transportation.

Was there a time in the past 12 months when you did not take your medication as prescribed because of cost? Do not include over-the-counter (OTC) medication. (343) (Y/N)

DURING THE PAST 12 MONTHS, have you had your blood pressure checked by a doctor, nurse, or other health professional? (Y/N)

DURING THE PAST 12 MONTHS, have you had your blood cholesterol checked by a doctor, nurse, or other health professional? (Y/N)

About how long has it been since you last visited a doctor for a routine checkup? A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition.

Within the past year (anytime less than 12 months ago)	Within the past 2 years (1 year but less than 2 years ago)	Within the past 5 years (2 years but less than 5 years ago)	5 or more years ago

Have you ever had a colonoscopy, sigmoidoscopy or fecal occult blood testing (FOBT)? (Colorectal cancer) [50+] (Y/N)

How long has it been since you had your last fecal occult blood testing (FOBT), sigmoidoscopy or colonoscopy?

1 Within the past year (anytime less than 12 months ago)	2 Within the past 2 years (1 year but less than 2 years ago)	3 Within the past 3 years (2 years but less than 3 years ago)	4 Within the past 5 years (3 years but less than 5 years ago)	5 5 or more years ago

A Prostate-Specific Antigen test, also called a PSA test, is a blood test used to check men for prostate cancer. Have you EVER HAD a PSA test? [M, 40+] (Y/N)

How long has it been since you had your last PSA test?

Within the past year (anytime less than 12 months ago)	Within the past 2 years (1 year but less than 2 years ago)	Within the past 3 years (2 years but less than 3 years ago)	Within the past 5 years (3 years but less than 5 years ago)	5 or more years ago

A mammogram is an x-ray of each breast to look for breast cancer. Have you ever had a mammogram? [W, 40+] (Y/N)

How long has it been since you had your last mammogram?

Within the past year (anytime less than 12 months ago)	Within the past 2 years (1 year but less than 2 years ago)	Within the past 3 years (2 years but less than 3 years ago)	Within the past 5 years (3 years but less than 5 years ago)	5 or more years ago

A Pap test is a test for cancer of the cervix. Have you ever had a Pap test? [W, 21-65] (Y/N)

How long has it been since you had your last Pap test?

Within the past year (anytime less than 12 months ago)	Within the past 2 years (1 year but less than 2 years ago)	Within the past 3 years (2 years but less than 3 years ago)	Within the past 5 years (3 years but less than 5 years ago)	5 or more years ago

Do you currently smoke or have you quit smoking within the past 15 years? (Y/N)

Have you ever had a screening for lung cancer? [55-80] (Y/N)

How long has it been since you were last screened for lung cancer?

Within the past year (anytime less than 12 months ago)	Within the past 2 years (1 year but less than 2 years ago)	Within the past 3 years (2 years but less than 3 years ago)	Within the past 5 years (3 years but less than 5 years ago)	5 or more years ago

Did you not receive one of the above screenings or routine check-up for any of the following reasons?

Cost	Unaware the screening was needed	Did not think the screening was worth the cost	Unsure of where to receive the screening	Travel distance to receive the screening

Did you receive any of these preventative screenings at a RAM clinic? (Y/N)

Appendix 3: Interview Question Source & USPTF Recommendation

Number	Question	Source	USPTF Recommendation
1	What is your age?	BRFSS	NA
2	Gender. Not asked directly but determined by interview responses.	NA	NA
3	What would you say is your race?	NA	NA
4	What is the highest grade or year of school you completed?	BRFSS	NA
5	What is the zip code where you live?	BRFSS	NA
6	Would you say that in general your health is—	BRFSS	NA
7	How many times have you been to a doctor, nurse, or other health professional in the past 12 months?	BRFSS	NA
8	How many of these visits were through Remote Area Medical (RAM), Health Wagon or a similar free health clinic?	BRFSS	NA
9	If you saw a doctor in the last 12 months, what health concern brought you to the doctor? (Primary, Secondary)	Project	NA
10	When you are sick or need advice about your health, to which one of the following places do you usually go? Would you say: a doctor's office, a public health clinic or community health center, a hospital outpatient department, a hospital emergency room, urgent care center, some other kind of place, or no usual place?	BRFSS	NA
11	Do you have one person you think of as your personal doctor or health care provider?	BRFSS	NA
12	Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?	BRFSS	NA
13	Have you delayed getting needed medical care for any of the following reasons in the past 12 months? Select the most important reason.	BRFSS	NA

14	Was there a time in the past 12 months when you did not take your medication as prescribed because of cost? Do not include over-the-counter (OTC) medication. (343)	BRFSS	NA
15	DURING THE PAST 12 MONTHS, have you had your blood pressure checked by a doctor, nurse, or other health professional?	BRFSS	18+. Evidence is lacking to recommend an optimal interval for screening adults for hypertension. "For adults age 18 or older. There is no evidence on which to base a recommendation for optimal interval. The Joint National Committee on Prevention Diagnosis and Treatment of High Blood Pressure recommends every 2 years in persons w/ initial BP < 120/80 and every year in persons with BP 120-139 or diastolic 80-89. VA/DoD guideline (2004) recommends annual" http://www.ncbi.nlm.nih.gov/books/NBK82767/
16	DURING THE PAST 12 MONTHS, have you had your blood cholesterol checked by a doctor, nurse, or other health professional?	BRFSS	The U.S. Preventive Services Task Force (USPSTF) strongly recommends screening men aged 35 and older for lipid disorders, The USPSTF strongly recommends screening women aged 45 and older for lipid disorders if they are at increased risk for coronary heart disease.
17	About how long has it been since you last visited a doctor for a routine checkup? A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition.	NHIS	No recommendation.
18	Have you ever had a colonoscopy, sigmoidiscopy or fecal occult blood testing (FOBT)? [Colorectal cancer, 50+]	NHIS	Annual screening with high-sensitivity fecal occult blood testing, Sigmoidoscopy every 5 years, with high-sensitivity fecal occult blood testing every 3 years, Screening colonoscopy every 10 years
19	How long has it been since you had your last fecal occult blood testing (FOBT), sigmoidoscopy or colonoscopy?	BRFSS	Annual screening with high-sensitivity fecal occult blood testing, Sigmoidoscopy every 5 years, with high-sensitivity fecal occult blood testing every 3 years, Screening colonoscopy every 10 years
20	A Prostate-Specific Antigen test, also called a PSA test, is a blood test used to check men for prostate cancer. Have you EVER HAD a PSA test?	BRFSS	No longer recommended by USPTF
21	How long has it been since you had your last PSA test?	BRFSS	No longer recommended by USPTF
22	A mammogram is an x-ray of each breast to look for breast cancer. Have you ever had a mammogram?	BRFSS	40-50 per patient. 50-75 every 2 years
23	How long has it been since you had your last mammogram?	BRFSS	40-50 per patient. 50-75 every 2 years
24	A Pap test is a test for cancer of the cervix. Have you ever had a Pap test?	BRFSS	21-65 every 3 years.recommends against screening for cervical cancer in women who have had a hysterectomy with removal of the cervix

25	How long has it been since you had your last Pap test?	BRFSS	21-65 every 3 years. Recommends against screening for cervical cancer in women who have had a hysterectomy with removal of the cervix
26	Do you currently smoke or have you quit smoking in the past 15 years?	Project	NA
27	Have you ever had a screening for lung cancer? (55-80)	Project	annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years
28	How long has it been since you were last screened for lung cancer?	Project	annual screening for lung cancer with low-dose computed tomography (LDCT) in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years
29	Did you not receive one of the above screenings or routine check up for any of the following reasons?	Project	NA
30	Did you receive any of these preventative screenings at a RAM clinic?	Project	NA